

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : **2002-000620**  
(43)Date of publication of application : **08.01.2002**

(51)Int.Cl. **A61C 1/12**

**A61C 1/08**

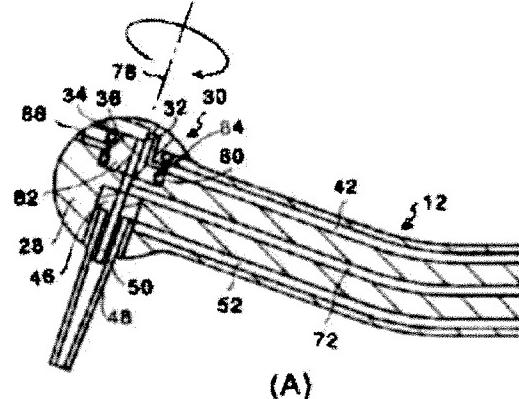
(21)Application number : **2000-190678** (71)Applicant : **MICRON:KK**  
(22)Date of filing : **26.06.2000** (72)Inventor : **FUKUDA HIDEKO**

## **(54) COMPRESSED AIR DRIVING DENTAL VACUUM HANDPIECE**

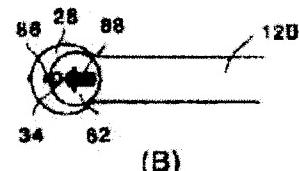
### **(57)Abstract:**

**PROBLEM TO BE SOLVED:** To provide a dental vacuum handpiece which does not need a backhose, has simple structure with few parts, and entails excellent operation.

**SOLUTION:** The ejector pump 30, which can rotate upon the axis 78, is included in the head 28 of the handpiece 12. The ejector pump 30 comprises the compressed air injection nozzle 32, the exhaust port 34 which opens forward, and the pressure port 36. The vacuum tube 48 connected to the pressure port 36 is inserted into a root canal of a tooth and sucks used cleansing water within the root canal by the pressure created from jetting compressed air. Sucked and used cleansing water is discharged from the exhaust port 34 to an oral cavity and sent to a dental unit through a vacuum in the oral cavity.



**(A)**



**(B)**

### **\* NOTICES \***

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

## **CLAIMS**

---

[Claim(s)]

[Claim 1]An ejector vacuum pump provided with compressed air injection nozzles, a diffuser port, and a negative pressure port is built into a handpiece main part, In vacuum handpiece for compressed air drive type dentistry which came to attract a fluid from siphon connected to a negative pressure port with negative pressure generated according to injection of compressed air, Vacuum handpiece for dentistry having built said ejector vacuum pump into a head of a handpiece main part, and carrying out the opening of the diffuser port of an ejector vacuum pump toward the exterior directly from a head of a main part.

[Claim 2]Vacuum handpiece for dentistry based on Claim 1, wherein one thru/or all of an injection nozzle, a diffuser port, and a negative pressure port of an ejector vacuum pump is formed by punching a head of a main part by machining.

[Claim 3]Said ejector vacuum pump has equipped a head of a main part with axis of rotation almost vertical to a longitudinal direction axis of handpiece pivotable as a center, Claim 1 making it possible to have and to make it point towards desired to a diffuser port, or vacuum handpiece for dentistry based on 2.

[Claim 4]Vacuum handpiece for dentistry based on Claim 3 having attached a mark which expresses direction of a diffuser port with a head of a main part.

[Claim 5]Vacuum handpiece for dentistry based on any of 4 they are from Claim 1 equipping a periphery of said siphon with a water circuit which supplies wash water further, and having formed a filter in said water circuit.

[Claim 6]Vacuum handpiece for dentistry based on any of 4 they are from Claim 1 provided with vacuum tweezers interexchangeably connected with said siphon in a negative pressure port of an ejector vacuum pump.

[Claim 7]Vacuum handpiece for dentistry based on any of 6 they are from Claim 1, wherein a handpiece main part consists of the two other half approximately and the body is equipped with the body in the second half removable in the first half.

[Claim 8]Vacuum handpiece for dentistry based on Claim 7 constituting so that it may have further the 2nd first half object with which a second half object of a handpiece main part is equipped exchangeable and the body may function as a three-way syringe said 2nd first half.

[Claim 9]Vacuum handpiece for dentistry based on Claim 7 constituting so that it may have further the 2nd first half object with which a second half object of a handpiece main part is equipped exchangeable and the body may function as excavator said 2nd first half.

**DETAILED DESCRIPTION**

---

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the dental handpiece of a compressed air drive, and relates to the vacuum handpiece for dentistry used for washing of the root canal of a tooth, and suction of a penetrant remover in more detail.

[0002]

[Description of the Prior Art]On the occasion of root canal treatment, by pouring in a penetrant remover into a root canal, the inside of a root canal is washed and a used penetrant remover is removed from a root canal by vacuum suction. The vacuum handpiece for dentistry of the compressed air drive used for washing of a root canal and penetrant remover suction is indicated by JP,61-50456,B and JP,H3-30369,B. In this vacuum handpiece, the ejector vacuum pump of the compressed air drive provided with compressed air injection nozzles, the diffuser port, and the negative pressure port is built into the center section of the handpiece main part, and negative pressure is generated in a negative pressure port according to injection of compressed air. The negative pressure port of the ejector vacuum pump is connected to the siphon with which it is equipped at the tip of a main part. The water circuit which supplies wash water to the periphery of the siphon is established in the inside of a main part.

[0003]When using it, this vacuum handpiece, It can connect with the existing hose for dentistry (a compressed air passage, a water passage, etc. are formed) extended from a dental unit interexchangeably with the turbine handpiece for tooth grinding, etc., and supply of compressed air and wash water is received from a dental unit. Wash water is transmitted in the circumferential rate of the siphon, and is supplied in a root canal, and the used wash water which washed the root canal is attracted from the siphon by operation of the negative pressure which an ejector vacuum pump generates.

[0004]Since the penetrant remover attracted from the inside of a root canal includes pus, the organization which necrosed, etc., discarding appropriately is preferred. So, in this vacuum handpiece, the penetrant remover attracted from the inside of a root canal returns with used compressed air, is sent to SUPITTON of a dental unit via a hose, and is discharged inside SUPITTON. For this reason, the return hose for exclusive use is provided between the vacuum handpiece and SUPITTON, The front end of this return hose is connected to the exhaust port (diffuser port) of the ejector vacuum pump built in the handpiece, and that back end is fixed inside SUPITTON using a sucker etc.

[0005]

[Problem(s) to be Solved by the Invention]Thus, to the vacuum handpiece of conventional technology. The hose for dentistry for supplying compressed air and pressure water (this is allocated between the vacuum handpiece and a dental unit) is not only connected, but, Since a return hose (this is allocated between the vacuum handpiece and SUPITTON) for exclusive use is connected, therefore a total of two hose is connected to the vacuum handpiece, grasping of the handpiece and handling become difficult and there is a difficulty that the operativity of the handpiece gets worse.

[0006]In order to return and to connect the diffuser port of an ejector vacuum pump to a hose, or [ making it point downward to a diffuser port vertically to the longitudinal direction axis of the handpiece as shown in Fig. 1 of JP,S61-50456,B ] -- or, After making it once point downward to an injection nozzle as shown in Fig. 2 of the gazette, L type must be made refracted toward back. If such a structure is used, the size of the ejector vacuum pump at the time of \*\*\*\* will become

large to a handpiece axis in a transverse direction (radial direction of the handpiece), and it will become difficult to grasp the handpiece by hand. If an ejector vacuum pump is enlarged in this way, an ejector vacuum pump must be arranged to the longitudinal direction middle position of the handpiece, and it will become an obstacle of operation too.

[0007]The purpose of this invention is to provide the vacuum handpiece for dentistry excellent in operativity. Other purposes of this invention do not need the return hose of conventional technology for exclusive use, but there are in providing the possible vacuum handpiece for dentistry of using it by connecting only the usual hose for dentistry. other purposes of this invention -- structure -- it is simple and there are few part mark -- manufacture -- it is easy and is in providing the vacuum handpiece for dentistry provided with the ejector vacuum pump which can be manufactured by low cost. Other purposes of this invention are to provide the multifunctional vacuum handpiece for dentistry so that it is possible to attain said purpose.

[0008]

[Means for Solving the Problem]It is common to insert a vacuum pipe in the mouth into a patient's mouth on the occasion of dentistry treatment, nowadays, in order to eliminate saliva, used cooling water of a turbine, and used wash water of a three-way syringe from the inside of a patient's mouth. Then, by constituting vacuum handpiece in structure which enables effective use of a vacuum in the mouth paying attention to a vacuum pipe in the mouth by which normal use is carried out in dentistry treatment, this invention will abolish a return hose of conventional technology, and will simplify vacuum handpiece.

[0009]Then, this invention builds an ejector vacuum pump provided with compressed air injection nozzles, a diffuser port, and a negative pressure port into a handpiece main part, In vacuum handpiece for dentistry which came to attract a fluid from siphon connected to a negative pressure port with negative pressure generated according to injection of compressed air, An ejector vacuum pump was built into a head of a handpiece main part, and the opening of the diffuser port of an ejector vacuum pump was directly carried out toward the exterior from a head of a main part.

[0010]When using vacuum handpiece of this invention, beforehand, a vacuum pipe in the mouth is inserted into a patient's mouth, and the suction opening is positioned to the side of a tooth which is going to carry out root canal treatment. After operating a vacuum in this mouth and starting suction in the mouth, vacuum handpiece of this invention is operated.

[0011]Since it has included in a head of a handpiece main part and a diffuser port has carried out the opening of the ejector vacuum pump toward the exterior in vacuum handpiece of this invention directly from a head of a main part, With used compressed air, a penetrant remover attracted from an inside of a root canal is once discharged in the mouth from a head of a main part. In this way, promptly, a penetrant remover and used compressed air which were once emitted in the mouth are attracted by vacuum pipe in the mouth, and are sent to a dental unit. Thus, since it was made to carry out suction discharging of the penetrant remover etc. from the inside of the mouth using a vacuum in the mouth by which makes once discharge in the mouth a penetrant remover attracted from an inside of a root canal, and normal use is carried out in

dentistry treatment, A return hose for exclusive use can be omitted and vacuum handpiece can be simplified.

[0012]In a desirable embodiment of this invention, at least one or all of an injection nozzle, a diffuser port, and a negative pressure port of an ejector vacuum pump is formed by punching a head of a main part by drilling. If it does in this way, it is simplified remarkably, part mark are reduced and structure of an ejector vacuum pump can be easily manufactured by low cost. Since it becomes possible to include in a head of handpiece since an ejector vacuum pump can be miniaturized and the part handpiece can be made into a thin figure, it becomes remarkably easy for an operating person to grasp and deal with handpiece.

[0013]In a desirable embodiment of this invention, an ejector vacuum pump makes it possible to have equipped a head of a main part with axis of rotation almost vertical to a longitudinal direction axis of handpiece pivotable as a center, to have, and to make it point towards desired to a diffuser port (exhaust port). Preferably, a mark showing direction of a diffuser port is given to a head of a handpiece main part. According to this embodiment, a diffuser port of an ejector vacuum pump can be turned to a direction of a vacuum in the mouth, and used washing liquid and compressed air can be effectively eliminated out of the mouth. Since it can have in optimal physical relationship and can cause only by turning an ejector vacuum pump, without changing an installed position of a vacuum in the mouth one by one even when physical relationship of an exhaust port of an ejector vacuum pump to a vacuum in the mouth is not suitable, dentistry treatment can be performed easily promptly.

[0014]A desirable embodiment is further provided with a water circuit which supplies wash water in accordance with a periphery of siphon, and a filter is formed in this water circuit. Other embodiments are provided with vacuum tweezers interexchangeably connected to an ejector vacuum pump with siphon.

[0015]In other desirable embodiments, a handpiece main part consists of the two other half approximately, and the body is equipped with the body in the second half removable in the first half. The body can be constituted this first half in order to function as a three-way syringe or excavator.

[0016]

[Embodiment of the Invention]The 1st working example of the vacuum handpiece of this invention is shown in drawing 3 from drawing 1. With reference to these figures, the vacuum handpiece 10 can be provided with the long and slender handpiece main part 12 which can be grasped by hand, and can constitute this handpiece main part 12 from two or more sections mutually connected by screwing, junction, and other suitable methods as illustrated.

[0017]In order to connect this vacuum handpiece 10 to the hose 14 for dentistry extended from a dental unit (not shown), to the back end of the handpiece main part 12. The plug part 16 of the ball-lock type quick joint of a conventional type is formed, and the socket part 18 attached at the tip of the hose 14 for dentistry is fitted in by one-touch control, enabling free attachment and detachment. The hose 14 for dentistry belongs to a conventional type, and although not illustrated, a compressed air passage, a water passage, etc. are formed in the inside as everyone

knows.

[0018]The back end of the handpiece main part 12 fits in the hose connection male member 19 provided at the tip of the hose 14 for dentistry again. When the handpiece main part 12 and the hose 14 for dentistry are connected, the compressed air passage in the hose 14 for dentistry is connected to the compressed air passage 20 formed in the handpiece main part 12, and the water passage in the hose 14 for dentistry is connected to the water passage 22 formed in the handpiece main part 12. In illustrated working example, the flow-control-valve mechanism 24 indicated to JP,7-16497,B is formed in the compressed air passage 20 in the handpiece main part 12, and the flow of the compressed air sent to the compressed air passage 20 is adjusted by turning the operation ring 26.

[0019]The ejector vacuum pump 30 of the compressed air drive is built into the head 28 of the handpiece main part 12. In illustrated working example, this ejector vacuum pump 30, The compressed air injection path 32 where it extends to a main part longitudinal direction, and a caliber acts as an injection nozzle small, The flueway 34 which acts as a diffuser port where the caliber which it was formed on the extension wire of the injection path 32, and carried out the opening toward the front is bigger, It comprises the suction passage (negative pressure port) 36 which intersects perpendicularly with this flueway 34, and if compressed air is injected toward the flueway (diffuser port) 34 from the injection path (injection nozzle) 32, negative pressure will occur in the suction passage (negative pressure port) 36.

[0020]Each can form easily and cheaply the injection path (injection nozzle) 32, the flueway (diffuser port) 34, and the suction passage (negative pressure port) 36 by punching the head 28 of a main part with a drill. Since the ejector vacuum pump 30 is realized only by carrying out drilling to the head 28 of a main part, structure is dramatically simple and does not need excessive parts.

[0021]Supply of compressed air to the injection path 32 of the ejector vacuum pump 30 is performed via the compressed air passage 20, the central cavity 38, and the compressed air passages 40 and 42 which were formed in the handpiece main part 12.

[0022]The siphon electrode holder 46 is fixed to the head 28 of the handpiece main part 12 using the nut 44 screwed there so that drawing 3 may show well. The siphon electrode holder 46 is equipped with the siphon 48 of the taper which was formed with the comparatively flexible transparent resin material etc. and which can be thrown away, enabling free attachment and detachment. The shaft-orientations passage 50 which was open for free passage to the suction passage 36 of the ejector vacuum pump 30 is formed in the siphon electrode holder 46, and the negative pressure generated in the suction passage 36 is told to the siphon 48.

[0023]Inside the handpiece main part 12, the water supply pipe 52 connected to the water passage 22 is arranged, and this water supply pipe 52 is open for free passage to the circular sulcus 54 formed in the head 28. Although not illustrated, between the nut 44 and the siphon electrode holder 46, Have formed some radial clearance or the shaft-orientations slot is formed, The upper part of the siphon 48 is supplied through such radial clearances or a shaft-orientations slot, and the wash water supplied to the circular sulcus 54 via the hose 14 for dentistry, the

water passage 22, and the water supply pipe 52 from the dental unit is transmitted, and trickles the periphery of the siphon 48.

[0024]The back run valve 56 is included in the central section of the handpiece main part 12. This back run valve 56 comprises the valve housing 64 provided with the compressed air entrance 58, the transverse direction valve chest 60, and the compressed air outlet 62, the spool-type-valve object 66 which fitted into the valve chest 60 slidably, and the push button 68. The side is made to have bypassed the water supply pipe 52 so that it may not interfere in the valve housing 64. The circular sulcus 70 is formed in the periphery of the spool-type-valve object 66. The circular sulcus 70 of the spool-type-valve object 66 is designed so that the compressed air entrance 58 may be open for free passage to the compressed air outlet 62, when the compressed air outlet 62 is intercepted from the compressed air entrance 58 and depresses the push button 68 at the time of un-operating of the spool-type-valve object 66.

[0025]The compressed air outlet 62 of the back run valve 56 is connected to the compressed-air-supply passage 74 formed in the head 28 by the compressed air pipe 72 which extends the inside of the handpiece main part 12. The opening of this compressed-air-supply passage 74 is carried out in the middle of the suction passage 36 of the ejector vacuum pump 30 so that drawing 3 may show well.

[0026]The vacuum handpiece 10 is connected to the hose 14 for dentistry from a dental unit at the time of use. Supply of compressed air and wash water is controlled by the foot switch (not shown) attached to a dental unit. On the occasion of root canal treatment, the suction opening of the vacuum in the mouth (not shown) is beforehand positioned to the side of the gear tooth with which it should deal within a patient's mouth, and vacuum suction is started. If supply of the wash water to the vacuum handpiece 10 is started by operating a foot switch, Wash water is supplied to the upper part of the siphon 48 via the clearance or the shaft-orientations slot between the water passage 22, the water supply pipe 52, the circular sulcus 54 and the nut 44, and the siphon electrode holder 46, and transmits for it and trickles the periphery of the siphon 48 from there. Therefore, a root canal can be washed if the tip of the siphon 48 is inserted into the root canal of a tooth.

[0027]If supply of compressed air is started by operation of a foot switch, compressed air will be sent to the injection path 32 of the ejector vacuum pump 30 via the compressed air passage 20, the central cavity 38, and the compressed air passages 40 and 42, and will be injected toward the flueway 34 from the injection path 32. As a result, negative pressure occurs in the suction passage 36, and the used wash water in a root canal is attracted via the siphon 48. With used compressed air, the attracted wash water is ahead discharged from the flueway 34, is attracted by the vacuum in the mouth arranged there, and is sent to a dental unit.

[0028]While using the vacuum handpiece 10, the shaft-orientations passage 50 of the siphon 48 or the siphon electrode holder 46 may be got blocked by attracting a tooth cutting piece etc. In that case, if the push button 68 of the back run valve 56 is depressed and the back run valve 56 is opened, the compressed air in the central cavity 38 will be injected via the compressed air pipe 72 and the compressed-air-supply passage 74 in the middle of the suction passage 36 of the

ejector vacuum pump 30. Although a part of compressed air injected by the suction passage 36 goes to the flueway 34, the remainder of compressed air flows backwards the shaft-orientations passage 50 and the siphon 48 of the siphon electrode holder 46, and blows away plugging. Thereby, the siphon 48 and the shaft-orientations passage 50 are cleaned.

[0029]The 2nd working example of the vacuum handpiece of this invention is shown in drawing 6 from drawing 4. In these figures, the same reference number shows the component of the 1st working example mentioned above, and a common component, and the overlapping explanation is omitted. With the ball-lock type quick joint 76, the handpiece main part 12 prepares the body 12B for explaining only a point of difference the body 12A and the first half the second half in which it was connected disengageable, separates the body 12B into it from the body 12A in the second half in the first half and can heat-sterilize it now with autoclave to explain.

[0030]The axis 78 of the siphon 48 and the dent 80 of the same axle cylindrical shape are formed in the head 28 of the handpiece main part 12, and the main part 82 of the approximate circle pilaster of the ejector vacuum pump 30 has equipped with the axis 78 pivotable as a center in this dent 80 so that drawing 6 may show well. The seal between the dent 80 and the main part 82 of an ejector vacuum pump is performed by the O ring of the illustrated couple. The slip off stop of the main part 82 of an ejector vacuum pump is performed by the retaining pin 86 which engages with the circular sulcus 84 formed in the periphery of the main part 82.

[0031]In this working example, the injection path (injection nozzle) 32, the flueway (diffuser port) 34, and the suction passage (negative pressure port) 36 of the ejector vacuum pump 30 are formed by carrying out drilling to the main part 82 of an ejector vacuum pump. Although the injection path 32 is formed in ZIG ZAG and is not illustrated by carrying out drilling of the three holes, the plug has closed the upper bed of the middle breakthrough suitably. The injection path 32 is open for free passage to the compressed air passage 42 via the circular sulcus 84 of the periphery of the main part 82.

[0032]As shown in drawing 6 (B), on the upper surface of the main part 82 of an ejector vacuum pump. The arrow mark 88 showing direction of the flueway (diffuser port) 34 is attached, and it is made easy that an operating person makes it circle in the ejector vacuum pump 30 so that the flueway 34 may turn to the suction opening of the vacuum device in the mouth.

[0033]With reference to drawing 5, the filter 90 is arranged in the middle of the water supply passage 52, and the outflow of bacteria is prevented by filtering the waterworks supplied from the dental unit.

[0034]Operation of the vacuum handpiece of this 2nd working example and the mode of use are the same as that of the 1st working example fundamentally. About a point of difference to explain in this 2nd working example. Since the ejector vacuum pump 30 can be made to be able to circle in the axis 78 as a center and the flueway 34 of the ejector vacuum pump 30 can be turned to the suction opening of the vacuum in the mouth, there is an advantage that the wash water and the used compressed air which were emitted from the flueway 34 can be effectively eliminated out of the mouth.

[0035]Drawing 7 shows the changed form of the vacuum handpiece of this invention. In this

changed form, a small object like the inlay which replaces with the siphon 48 in the suction passage 36 of the ejector vacuum pump 30, and has connected the vacuum tweezers 92, for example, fell in the mouth is adsorbed.

[0036] Drawing 8 and drawing 9 show the possible replacement parts of equipping the body 12A in the second half interexchangeably with the first half object 12B of the handpiece main part 12 of the vacuum handpiece concerning said 2nd working example. The water injection passage 94 and the compressed air injection path 96 are established in the replacement parts 12C, and it comprises an example shown in drawing 8 in order to function as a three-way syringe. In the example shown in drawing 9, it has equipped with the excavator 102 provided with the spatula 98 and the suction passage 100 at the tip of the replacement parts 12D, and suction removes the organization which scratched with the spatula 98.

[0037] Although specific working example of this invention was indicated above, this invention is not limited to this and can perform various corrections and change. For example, three passages (port) of an ejector vacuum pump can also be formed by casting of metal or molding of a plastic also besides being based on machining. As irrigation-of-root-canal liquid, it can replace with the waterworks from a dental unit, and a drug solution can be used.

## **TECHNICAL FIELD**

---

[Field of the Invention] This invention relates to the dental handpiece of a compressed air drive, and relates to the vacuum handpiece for dentistry used for washing of the root canal of a tooth, and suction of a penetrant remover in more detail

## **PRIOR ART**

---

[Description of the Prior Art] On the occasion of root canal treatment, by pouring in a penetrant remover into a root canal, the inside of a root canal is washed and a used penetrant remover is removed from a root canal by vacuum suction. The vacuum handpiece for dentistry of the compressed air drive used for washing of a root canal and penetrant remover suction is indicated by JP,61-50456,B and JP,H3-30369,B. In this vacuum handpiece, the ejector vacuum pump of the compressed air drive provided with compressed air injection nozzles, the diffuser port, and the negative pressure port is built into the center section of the handpiece main part, and negative pressure is generated in a negative pressure port according to injection of compressed air. The negative pressure port of the ejector vacuum pump is connected to the siphon with which it equipped at the tip of a main part. The water circuit which supplies wash water to the periphery of the siphon is established in the inside of a main part.

[0003] When using it, this vacuum handpiece, It can connect with the existing hose for dentistry (a compressed air passage, a water passage, etc. are formed) extended from a dental unit interexchangeably with the turbine handpiece for tooth grinding, etc., and supply of compressed air and wash water is received from a dental unit. Wash water is transmitted in the circumferential rate of the siphon, and is supplied in a root canal, and the used wash water which washed the root canal is attracted from the siphon by operation of the negative pressure which an

ejector vacuum pump generates.

[0004]Since the penetrant remover attracted from the inside of a root canal includes pus, the organization which necrosed, etc., discarding appropriately is preferred. So, in this vacuum handpiece, the penetrant remover attracted from the inside of a root canal returns with used compressed air, is sent to SUPITTON of a dental unit via a hose, and is discharged inside SUPITTON. For this reason, the return hose for exclusive use is provided between the vacuum handpiece and SUPITTON, The front end of this return hose is connected to the exhaust port (diffuser port) of the ejector vacuum pump built in the handpiece, and that back end is fixed inside SUPITTON using a sucker etc.

## TECHNICAL PROBLEM

---

[Problem(s) to be Solved by the Invention]Thus, to the vacuum handpiece of conventional technology. The hose for dentistry for supplying compressed air and pressure water (this is allocated between the vacuum handpiece and a dental unit) is not only connected, but, Since a return hose (this is allocated between the vacuum handpiece and SUPITTON) for exclusive use is connected, therefore a total of two hose is connected to the vacuum handpiece, grasping of the handpiece and handling become difficult and there is a difficulty that the operativity of the handpiece gets worse.

[0006]In order to return and to connect the diffuser port of an ejector vacuum pump to a hose, or [ making it point downward to a diffuser port vertically to the longitudinal direction axis of the handpiece as shown in Fig. 1 of JP,S61-50456,B ] -- or, After making it once point downward to an injection nozzle as shown in Fig. 2 of the gazette, L type must be made refracted toward back. If such a structure is used, the size of the ejector vacuum pump at the time of \*\*\*\* will become large to a handpiece axis in a transverse direction (radial direction of the handpiece), and it will become difficult to grasp the handpiece by hand. If an ejector vacuum pump is enlarged in this way, an ejector vacuum pump must be arranged to the longitudinal direction middle position of the handpiece, and it will become an obstacle of operation too.

[0007]The purpose of this invention is to provide the vacuum handpiece for dentistry excellent in operativity. Other purposes of this invention do not need the return hose of conventional technology for exclusive use, but there are in providing the possible vacuum handpiece for dentistry of using it by connecting only the usual hose for dentistry. other purposes of this invention -- structure -- it is simple and there are few part mark -- manufacture -- it is easy and is in providing the vacuum handpiece for dentistry provided with the ejector vacuum pump which can be manufactured by low cost. Other purposes of this invention are to provide the multifunctional vacuum handpiece for dentistry so that it is possible to attain said purpose.

## MEANS

---

[Means for Solving the Problem]It is common to insert a vacuum pipe in the mouth into a patient's mouth on the occasion of dentistry treatment, nowadays, in order to eliminate saliva, used cooling water of a turbine, and used wash water of a three-way syringe from the inside of a

patient's mouth. Then, by constituting vacuum handpiece in structure which enables effective use of a vacuum in the mouth paying attention to a vacuum pipe in the mouth by which normal use is carried out in dentistry treatment, this invention will abolish a return hose of conventional technology, and will simplify vacuum handpiece.

[0009]Then, this invention builds an ejector vacuum pump provided with compressed air injection nozzles, a diffuser port, and a negative pressure port into a handpiece main part, In vacuum handpiece for dentistry which came to attract a fluid from siphon connected to a negative pressure port with negative pressure generated according to injection of compressed air, An ejector vacuum pump was built into a head of a handpiece main part, and the opening of the diffuser port of an ejector vacuum pump was directly carried out toward the exterior from a head of a main part.

[0010]When using vacuum handpiece of this invention, beforehand, a vacuum pipe in the mouth is inserted into a patient's mouth, and the suction opening is positioned to the side of a tooth which is going to carry out root canal treatment. After operating a vacuum in this mouth and starting suction in the mouth, vacuum handpiece of this invention is operated.

[0011]Since it has included in a head of a handpiece main part and a diffuser port has carried out the opening of the ejector vacuum pump toward the exterior in vacuum handpiece of this invention directly from a head of a main part, With used compressed air, a penetrant remover attracted from an inside of a root canal is once discharged in the mouth from a head of a main part. In this way, promptly, a penetrant remover and used compressed air which were once emitted in the mouth are attracted by vacuum pipe in the mouth, and are sent to a dental unit. Thus, since it was made to carry out suction discharging of the penetrant remover etc. from the inside of the mouth using a vacuum in the mouth by which makes once discharge in the mouth a penetrant remover attracted from an inside of a root canal, and normal use is carried out in dentistry treatment, A return hose for exclusive use can be omitted and vacuum handpiece can be simplified.

[0012]In a desirable embodiment of this invention, at least one or all of an injection nozzle, a diffuser port, and a negative pressure port of an ejector vacuum pump is formed by punching a head of a main part by drilling. If it does in this way, it is simplified remarkably, part mark are reduced and structure of an ejector vacuum pump can be easily manufactured by low cost. Since it becomes possible to include in a head of handpiece since an ejector vacuum pump can be miniaturized and the part handpiece can be made into a thin figure, it becomes remarkably easy for an operating person to grasp and deal with handpiece.

[0013]In a desirable embodiment of this invention, an ejector vacuum pump makes it possible to have equipped a head of a main part with axis of rotation almost vertical to a longitudinal direction axis of handpiece pivotable as a center, to have, and to make it point towards desired to a diffuser port (exhaust port). Preferably, a mark showing direction of a diffuser port is given to a head of a handpiece main part. According to this embodiment, a diffuser port of an ejector vacuum pump can be turned to a direction of a vacuum in the mouth, and used washing liquid and compressed air can be effectively eliminated out of the mouth. Since it can have in optimal

physical relationship and can cause only by turning an ejector vacuum pump, without changing an installed position of a vacuum in the mouth one by one even when physical relationship of an exhaust port of an ejector vacuum pump to a vacuum in the mouth is not suitable, dentistry treatment can be performed easily promptly.

[0014]A desirable embodiment is further provided with a water circuit which supplies wash water in accordance with a periphery of siphon, and a filter is formed in this water circuit. Other embodiments are provided with vacuum tweezers interexchangeably connected to an ejector vacuum pump with siphon.

[0015]In other desirable embodiments, a handpiece main part consists of the two other half approximately, and the body is equipped with the body in the second half removable in the first half. The body can be constituted this first half in order to function as a three-way syringe or excavator.

[0016]

[Embodiment of the Invention]The 1st working example of the vacuum handpiece of this invention is shown in drawing 3 from drawing 1. With reference to these figures, the vacuum handpiece 10 can be provided with the long and slender handpiece main part 12 which can be grasped by hand, and can constitute this handpiece main part 12 from two or more sections mutually connected by screwing, junction, and other suitable methods as illustrated.

[0017]In order to connect this vacuum handpiece 10 to the hose 14 for dentistry extended from a dental unit (not shown), to the back end of the handpiece main part 12. The plug part 16 of the ball-lock type quick joint of a conventional type is formed, and the socket part 18 attached at the tip of the hose 14 for dentistry is fitted in by one-touch control, enabling free attachment and detachment. The hose 14 for dentistry belongs to a conventional type, and although not illustrated, a compressed air passage, a water passage, etc. are formed in the inside as everyone knows.

[0018]The back end of the handpiece main part 12 fits in the hose connection male member 19 provided at the tip of the hose 14 for dentistry again. When the handpiece main part 12 and the hose 14 for dentistry are connected, the compressed air passage in the hose 14 for dentistry is connected to the compressed air passage 20 formed in the handpiece main part 12, and the water passage in the hose 14 for dentistry is connected to the water passage 22 formed in the handpiece main part 12. In illustrated working example, the flow-control-valve mechanism 24 indicated to JP,7-16497,B is formed in the compressed air passage 20 in the handpiece main part 12, and the flow of the compressed air sent to the compressed air passage 20 is adjusted by turning the operation ring 26.

[0019]The ejector vacuum pump 30 of the compressed air drive is built into the head 28 of the handpiece main part 12. In illustrated working example, this ejector vacuum pump 30, The compressed air injection path 32 where it extends to a main part longitudinal direction, and a caliber acts as an injection nozzle small, The flueway 34 which acts as a diffuser port where the caliber which it was formed on the extension wire of the injection path 32, and carried out the opening toward the front is bigger, It comprises the suction passage (negative pressure port) 36

which intersects perpendicularly with this flueway 34, and if compressed air is injected toward the flueway (diffuser port) 34 from the injection path (injection nozzle) 32, negative pressure will occur in the suction passage (negative pressure port) 36.

[0020]Each can form easily and cheaply the injection path (injection nozzle) 32, the flueway (diffuser port) 34, and the suction passage (negative pressure port) 36 by punching the head 28 of a main part with a drill. Since the ejector vacuum pump 30 is realized only by carrying out drilling to the head 28 of a main part, structure is dramatically simple and does not need excessive parts.

[0021]Supply of compressed air to the injection path 32 of the ejector vacuum pump 30 is performed via the compressed air passage 20, the central cavity 38, and the compressed air passages 40 and 42 which were formed in the handpiece main part 12.

[0022]The siphon electrode holder 46 is fixed to the head 28 of the handpiece main part 12 using the nut 44 screwed there so that drawing 3 may show well. The siphon electrode holder 46 is equipped with the siphon 48 of the taper which was formed with the comparatively flexible transparent resin material etc. and which can be thrown away, enabling free attachment and detachment. The shaft-orientations passage 50 which was open for free passage to the suction passage 36 of the ejector vacuum pump 30 is formed in the siphon electrode holder 46, and the negative pressure generated in the suction passage 36 is told to the siphon 48.

[0023]Inside the handpiece main part 12, the water supply pipe 52 connected to the water passage 22 is arranged, and this water supply pipe 52 is open for free passage to the circular sulcus 54 formed in the head 28. Although not illustrated, between the nut 44 and the siphon electrode holder 46, Have formed some radial clearance or the shaft-orientations slot is formed, The upper part of the siphon 48 is supplied through such radial clearances or a shaft-orientations slot, and the wash water supplied to the circular sulcus 54 via the hose 14 for dentistry, the water passage 22, and the water supply pipe 52 from the dental unit is transmitted, and trickles the periphery of the siphon 48.

[0024]The back run valve 56 is included in the central section of the handpiece main part 12. This back run valve 56 comprises the valve housing 64 provided with the compressed air entrance 58, the transverse direction valve chest 60, and the compressed air outlet 62, the spool-type-valve object 66 which fitted into the valve chest 60 slidably, and the push button 68. The side is made to have bypassed the water supply pipe 52 so that it may not interfere in the valve housing 64. The circular sulcus 70 is formed in the periphery of the spool-type-valve object 66. The circular sulcus 70 of the spool-type-valve object 66 is designed so that the compressed air entrance 58 may be open for free passage to the compressed air outlet 62, when the compressed air outlet 62 is intercepted from the compressed air entrance 58 and depresses the push button 68 at the time of un-operating of the spool-type-valve object 66.

[0025]The compressed air outlet 62 of the back run valve 56 is connected to the compressed-air-supply passage 74 formed in the head 28 by the compressed air pipe 72 which extends the inside of the handpiece main part 12. The opening of this compressed-air-supply passage 74 is carried out in the middle of the suction passage 36 of the ejector vacuum pump 30 so that drawing 3 may

show well.

[0026]The vacuum handpiece 10 is connected to the hose 14 for dentistry from a dental unit at the time of use. Supply of compressed air and wash water is controlled by the foot switch (not shown) attached to a dental unit. On the occasion of root canal treatment, the suction opening of the vacuum in the mouth (not shown) is beforehand positioned to the side of the gear tooth with which it should deal within a patient's mouth, and vacuum suction is started. If supply of the wash water to the vacuum handpiece 10 is started by operating a foot switch, Wash water is supplied to the upper part of the siphon 48 via the clearance or the shaft-orientations slot between the water passage 22, the water supply pipe 52, the circular sulcus 54 and the nut 44, and the siphon electrode holder 46, and transmits for it and trickles the periphery of the siphon 48 from there. Therefore, a root canal can be washed if the tip of the siphon 48 is inserted into the root canal of a tooth.

[0027]If supply of compressed air is started by operation of a foot switch, compressed air will be sent to the injection path 32 of the ejector vacuum pump 30 via the compressed air passage 20, the central cavity 38, and the compressed air passages 40 and 42, and will be injected toward the flueway 34 from the injection path 32. As a result, negative pressure occurs in the suction passage 36, and the used wash water in a root canal is attracted via the siphon 48. With used compressed air, the attracted wash water is ahead discharged from the flueway 34, is attracted by the vacuum in the mouth arranged there, and is sent to a dental unit.

[0028]While using the vacuum handpiece 10, the shaft-orientations passage 50 of the siphon 48 or the siphon electrode holder 46 may be got blocked by attracting a tooth cutting piece etc. In that case, if the push button 68 of the back run valve 56 is depressed and the back run valve 56 is opened, the compressed air in the central cavity 38 will be injected via the compressed air pipe 72 and the compressed-air-supply passage 74 in the middle of the suction passage 36 of the ejector vacuum pump 30. Although a part of compressed air injected by the suction passage 36 goes to the flueway 34, the remainder of compressed air flows backwards the shaft-orientations passage 50 and the siphon 48 of the siphon electrode holder 46, and blows away plugging. Thereby, the siphon 48 and the shaft-orientations passage 50 are cleaned.

[0029]The 2nd working example of the vacuum handpiece of this invention is shown in drawing 6 from drawing 4. In these figures, the same reference number shows the component of the 1st working example mentioned above, and a common component, and the overlapping explanation is omitted. With the ball-lock type quick joint 76, the handpiece main part 12 prepares the body 12B for explaining only a point of difference the body 12A and the first half the second half in which it was connected disengageable, separates the body 12B into it from the body 12A in the second half in the first half and can heat-sterilize it now with autoclave to explain.

[0030]The axis 78 of the siphon 48 and the dent 80 of the same axle cylindrical shape are formed in the head 28 of the handpiece main part 12, and the main part 82 of the approximate circle pilaster of the ejector vacuum pump 30 has equipped with the axis 78 pivotable as a center in this dent 80 so that drawing 6 may show well. The seal between the dent 80 and the main part 82 of an ejector vacuum pump is performed by the O ring of the illustrated couple. The slip off stop of

the main part 82 of an ejector vacuum pump is performed by the retaining pin 86 which engages with the circular sulcus 84 formed in the periphery of the main part 82.

[0031]In this working example, the injection path (injection nozzle) 32, the flueway (diffuser port) 34, and the suction passage (negative pressure port) 36 of the ejector vacuum pump 30 are formed by carrying out drilling to the main part 82 of an ejector vacuum pump. Although the injection path 32 is formed in ZIG ZAG and is not illustrated by carrying out drilling of the three holes, the plug has closed the upper bed of the middle breakthrough suitably. The injection path 32 is open for free passage to the compressed air passage 42 via the circular sulcus 84 of the periphery of the main part 82.

[0032]As shown in drawing 6 (B), on the upper surface of the main part 82 of an ejector vacuum pump. The arrow mark 88 showing direction of the flueway (diffuser port) 34 is attached, and it is made easy that an operating person makes it circle in the ejector vacuum pump 30 so that the flueway 34 may turn to the suction opening of the vacuum device in the mouth.

[0033]With reference to drawing 5, the filter 90 is arranged in the middle of the water supply passage 52, and the outflow of bacteria is prevented by filtering the waterworks supplied from the dental unit.

[0034]Operation of the vacuum handpiece of this 2nd working example and the mode of use are the same as that of the 1st working example fundamentally. About a point of difference to explain in this 2nd working example. Since the ejector vacuum pump 30 can be made to be able to circle in the axis 78 as a center and the flueway 34 of the ejector vacuum pump 30 can be turned to the suction opening of the vacuum in the mouth, there is an advantage that the wash water and the used compressed air which were emitted from the flueway 34 can be effectively eliminated out of the mouth.

[0035]Drawing 7 shows the changed form of the vacuum handpiece of this invention. In this changed form, a small object like the inlay which replaces with the siphon 48 in the suction passage 36 of the ejector vacuum pump 30, and has connected the vacuum tweezers 92, for example, fell in the mouth is adsorbed.

[0036]Drawing 8 and drawing 9 show the possible replacement parts of equipping the body 12A in the second half interexchangeably with the first half object 12B of the handpiece main part 12 of the vacuum handpiece concerning said 2nd working example. The water injection passage 94 and the compressed air injection path 96 are established in the replacement parts 12C, and it comprises an example shown in drawing 8 in order to function as a three-way syringe. In the example shown in drawing 9, it has equipped with the excavator 102 provided with the spatula 98 and the suction passage 100 at the tip of the replacement parts 12D, and suction removes the organization which scratched with the spatula 98.

[0037]Although specific working example of this invention was indicated above, this invention is not limited to this and can perform various corrections and change. For example, three passages (port) of an ejector vacuum pump can also be formed by casting of metal or molding of a plastic also besides being based on machining. As irrigation-of-root-canal liquid, it can replace with the waterworks from a dental unit, and a drug solution can be used.

## **DESCRIPTION OF DRAWINGS**

---

[Brief Description of the Drawings]

[Drawing 1]It is a side view of the vacuum handpiece for dentistry concerning the 1st working example of this invention.

[Drawing 2]It is a sectional view of the handpiece shown in drawing 1.

[Drawing 3]It is an expanded sectional view of the head of the handpiece shown in drawing 2.

[Drawing 4]It is a side view of the vacuum handpiece for dentistry concerning the 2nd working example of this invention.

[Drawing 5]It is a sectional view of the handpiece shown in drawing 4.

[Drawing 6]The expanded sectional view of the head of the handpiece which showed drawing 5 drawing 6 (A), and drawing 6 (B) are the top views which looked at the head of the handpiece shown in drawing 6 (A) from the top.

[Drawing 7]the changed form of the handpiece shown in drawing 4 and drawing 5 is shown -- it is a notch side view in part.

[Drawing 8]It is a sectional view of the replacement parts of the handpiece shown in drawing 4 and drawing 5.

[Drawing 9]It is a sectional view of other replacement parts of the handpiece shown in drawing 4 and drawing 5.

[Description of Notations]

10: Vacuum handpiece for dentistry

12: Handpiece main part

12A: The second half object of a main part

12B: The first half object of a main part

12C: Three-way syringe

28: The head of a handpiece main part

30: Ejector vacuum pump

32: Compressed air injection path (injection nozzle)

34: Flueway (diffuser port)

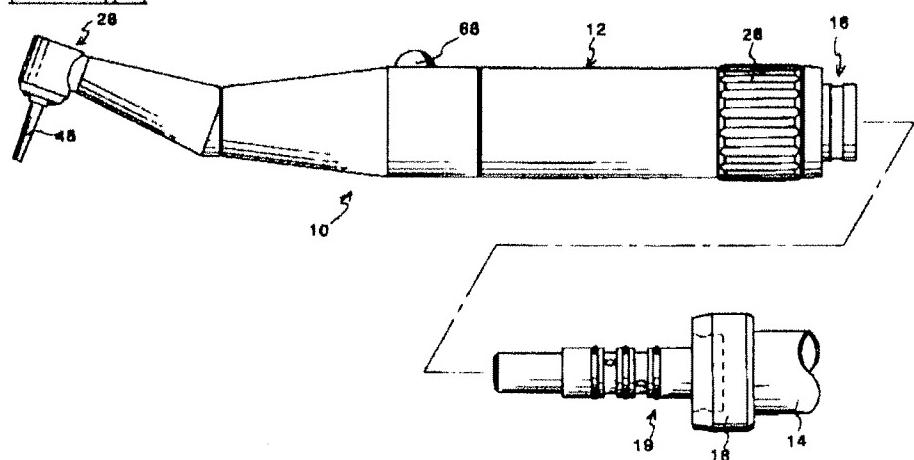
36: Suction passage (negative pressure port)

90: Filter

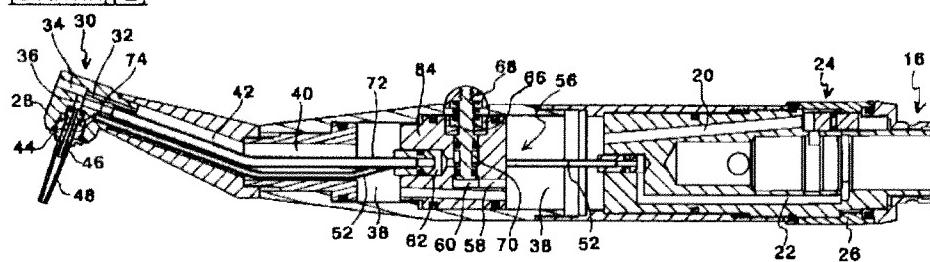
92: Vacuum tweezers

102: Excavator

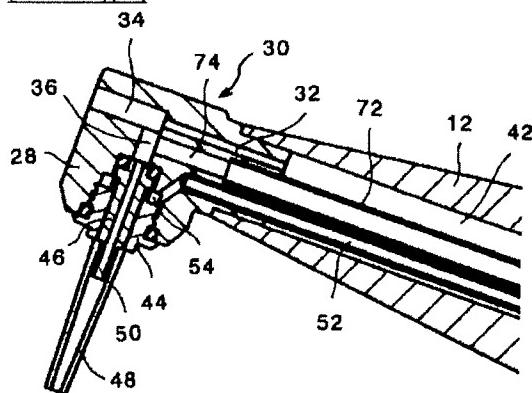
[Drawing 1]



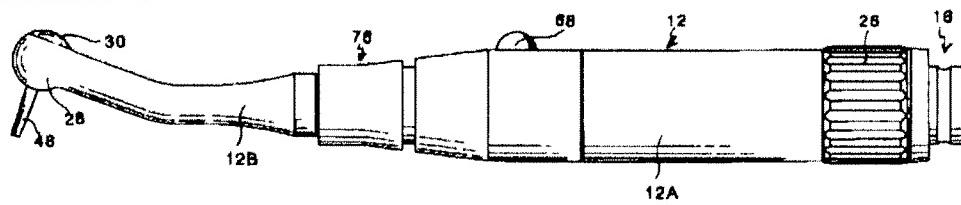
[Drawing 2]



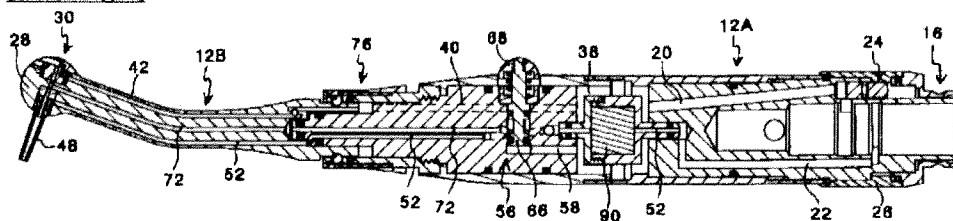
[Drawing 3]



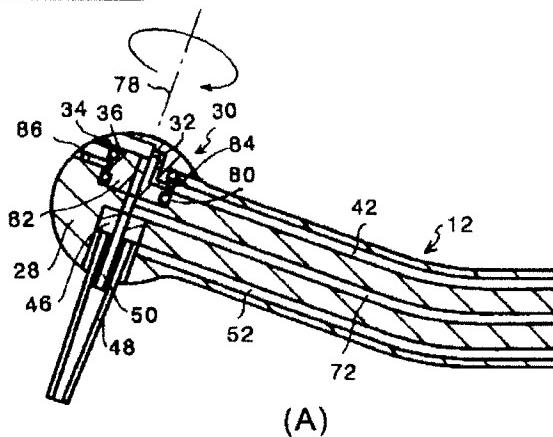
[Drawing 4]



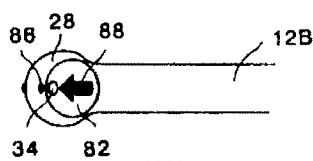
[Drawing 5]



[Drawing 6]

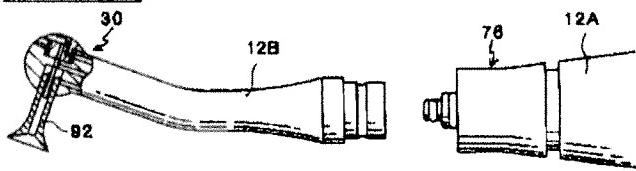


(A)

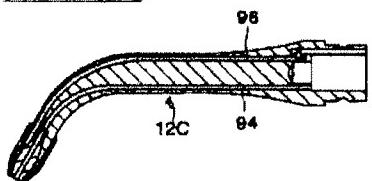


(B)

[Drawing 7]



[Drawing 8]



[Drawing 9]

